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1. Overview

... on a smart pointer in Borland C++ Builder, C++ Builder expects the ... intf ... 0
 @ c:\program files\borland\cbuilder6\include ... CLSID defined in the imported .tlb
 file ...
support.symphonica.com/support2/article.asp?articleID=124 [cached](#)

2. Borland's C++ Builder and the Visual Component Library (MICROSOFT POWERPOINT)

... C++ Builder also uses the Name property when building names for Event ...
 Copyright © 1998 Borland - From Borland Delphi 4 Developer's Guide by ... tlb
 TToolBar. ...
www.uwgb.edu/laplant/bcs371/pp/CPPBuilderPart1.ppt [view as html](#)

3. Iocomp Software - Product Compatibility

... of our VCL/CLX products for Borland Delphi or Borland C++ Builder, please
 understand ... We recommend that you backup the ActiveX OCX, TLB, and License
 Registry ...
www.iocomp.com/products/compatibility.htm [cached](#) | [more results from this site](#)

4. Delphi Spirit A WYSIWYG tool for making cool themes! ADD UPDATE

... Athlant™ brings Borland® Delphi™ and Borland® C++ Builder developers to ...
 If you work with VSS and C++ Builder you will ... don't publish a complete TLB file.
 ...
www.delphispirit.com/vrd/Delphi/11/72 [cached](#)

5. Borland C++ Builder

... Borland C++ Builder 5.0 Known Bugs/Defects. ... Area: compiler/c++\rms compat.
 ... import "C:\Program Files\Common Files\System\ADO\msado20.tlb"
 no_namespace rename("EOF ...
info.borland.com/devsupport/bcppbuilder/bugs/bcppbuilder5/bugs/compiler.html
[cached](#)

6. DevRace - Athlant

... Borland Delphi 5-7 and Borland C++ Builder 5-6 ... without restarting Delphi and
 C++ Builder and synchronize ... cfp, my_project.dof, my_project.tlb,
 my_project.todo, ...
www.consist.itvatlant.htm [cached](#)

7. Useful Information

... with MinGW or another compiler like Borland C++ Builder or Open ... lib's
 distributed with Microsoft Visual C++ 6.0, not ... before upgrading Stdole2.tlb (and
 undefine ...
nsis.sourceforge.net/Docs/AppendixC.html [cached](#)

8. Richmann's Software Free Programs

... and lately, Borland C++ Builder and Delphi 3 programs ... This is my first ever

<http://search.yahoo.com/search?p=Borland+C%2B%2B+Builder+tlb&ei=UTF-8&fr=fp-top> 8/29/03
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... создается библиотека TLB, которая делегирует ... приложений - Inprise C++
 Builder 4, а ... API), только Borland C ...
www.interface.ru/news/sem170399.htm [cached](#) | [more results from this site](#)

19. Programming Tools (Page 49 of 61) - WindowsPC.com

... Visual C++, Microsoft Access, Borland Delphi, Borland C++ Builder) ... either
 stand-alone file (.TLB) or integrating ... like internal Delphi/C++ Builder type
 library ...
www.windowspc.com/prog49.htm [cached](#)

20. создать новую тему

... что метод new, проверяя tlb, сразу распознает ...
forum.codenet.ru/showthread.php?threadid=5021 [cached](#) | [more results from this site](#)

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Borland C Builder program, and made with an old version 1 I had laying around. ...
us.share.geocities.com/richmannsoft/examples.html [cached](#)

9. Application Deployment

... C++ Builder, dll, 1,352 Kb. ... (Welcome to DLL hell). Borland Delphi is the
 exception, just copy the executables. ... COMCAT.DLL, 6 Kb. STDOLE2.TLB, 18 Kb.
 ...
www.cpcug.org/user/clemenzi/technical/Languages/Deployment.htm [cached](#)

10. Borland - Visual C++ から C++Builder ...

... ここでは、Visual C++ 6.0のためのプロジェクトの例として ... リンクされます。
 C++Builderには ... Borland® Copyright© 2003 Borland Software ...
www.borland.co.jp/cppbuilder/papers/vctocb/chapa4.html [cached](#) | [more results from this site](#)

11. Borland Delphi 4.0 для начинающих - ...

... Borland Delphi 4.0 для начинающих - Библиотеки типов ... о тпках в файле с
 расширением TLB, который в ...
www.codenet.ru/progr/delphi/learn/library_types.php [cached](#)

12. SoftWare ソフトウェアランタイム

... 5.83MB (6,120,889byte), VBSJP.dll MSVBVM50.dll StdOle2.tlb OleAut32.dll ...
 Borland C++ Builder 6 ランタイム, VCLJPG60.JPN VISUALCLX60.JPN
 VCL60.BPL VCLX60.BPL ...
buntatchi.kir.jp/article/software_runtime.shtml [cached](#)

13. Часто задаваемые вопросы по C++ BUILDER (...)

... A(SE): По поводу использования TLB. ... Или вызывать руками через
 Programs\Borland C++ Builder\Help\MS SDK Help Files ...
www.technote.ru/bcb_faqs.htm [cached](#)

14. Hyperlink: Programação: Ferramentas: Util

... For Windows 9x/NT/2000, written in C++ (Borland C++ Builder 5.0), Free
 software under ... symbol across multiple .LIB files or COM type libraries
 (tlb; olb; dll ...
www.mhavia.com.br/link/prog/tool/prog-util.html [cached](#)

15. Nl vs Borland

... saying that they were no longer supporting Borland products (despite ... You
 MUST apply the patches to Builder before installing ... C++ Builder 6 & Component
 Works 2 ...
www.pncomputing.biz/Nl.html [cached](#)

16. ActiveX and the VCL (part 2) : Connecting to ActiveX Servers

... type definitions and VC++ and Borland compatible static ... Win32 development
 packages, such as C++ Builder, Delphi, JBuilder, and Visual C++, have such a ...
community.borland.com/article/0,1410,20677,00.html [cached](#) | [more results from this site](#)

17. Delphi Articles

... via ODBC using Delphi or C++ Builder - by Borland ... to Delphi 7 VisiBroker 4.5
 - by Borland Developer Support ... use tibimp to convert VisiBroker 3.3 tlb files to ...
www.kkhoc.ac.ir/Touska%20Forum/Articles/TDPFArticles2.htm [cached](#)

18. Использование технологии MIDAS и CORBA в ...

<http://search.yahoo.com/search?p=Borland+C%2B%2B+Builder+tlb&ei=UTF-8&fr=fp-top> 8/29/03

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1. **[BORLAND C++BUILDER 3 COMPETITIVE MATRIX](#)**
C++Builder 3 Competitive Matrix, **Borland** C++Builder 3, Microsoft Visual C++ 5.0.
... One step ActiveX / ATL: **Integrated IDL** / TypeLibrary compiler. Yes, No. ...
www.tietovayla.fi/BORLAND/CPLUS/bcppbuilder/3/compmatrix.html [cached](#) | [more results from this site](#)
2. **[Symantec.com](#)**
... for Java, server interfaces are specified with the **integrated IDL** editor, which ...
integrating with other Java development tools including **Borland's** JBuilder and ...
www.symantec.com/press/1997/n971215.html [cached](#)
3. **[C++Builder 5 Features & Benefits \(PDF\)](#)**
... ENTIRE DEVELOPMENT TEAM A BOOST IN PRODUCTIVITY .14 9 **BORLAND**
TRANSLATION SUITE ... layered atop the new POA APIs IDL Integration **Integrated**
IDL simplifies CORBA ...
www.its.unimelb.edu.au/ucs/info/software/c.pdf [view as html](#)

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- Borland AppServer Solution Sheet** ... Borland AppServer builds on a proven foundation of VisiBroker(tm) the Integrated Transaction Service (ITS), and industry standards such as CORBA, IDL, C++ ... info.borland.com/appserver/aps4/aps4_solsheet.html [cached](#) | [more results from this site](#)
- BORLAND C++BUILDER 3 COMPETITIVE MATRIX** C++Builder 3 Competitive Matrix, Borland C++Builder 3, Microsoft Visual C++ 5.0. ... One step ActiveX / ATL: Integrated IDL / TypeLibrary compiler. Yes, No. ... www.tietovayla.fi/BORLAND/CPLUS/bcppbuilder3/compmatrix.html [cached](#) | [more results from this site](#)
- Borland Product Certification** ... Event Handling Exception Handling Integrated Development Environment ... Windows Basic IPC BDE Borland Conventions Database ... General CORBA concepts IDL Concepts IDL ... www.borland.co.za/services/training/prodcert.htm [cached](#)
- White Paper (PDF)** ... Java,™ C++, C#, © Microsoft © Visual Basic © 6, Visual Basic.NET, and IDL. ... An integrated and agile design environment, Borland Together Edition ... www.borland.com/hk/together/pdf/tgr_faq.pdf [view as html](#)
- Borland VisiBroker-RT - CORBA for Network Management** ... and be served from a Web/HTTP server integrated into the ... IDL information models can be much more efficient and ... Copyright© 2002 Borland Software Corporation. ... www.highlander.com/products/corba_for_network_management.html [cached](#)
- Micromail - Borland C++Builder 6.0 Enterprise Edition Upgrade** ... C++Builder 5 Professional users on <http://shop.borland.com/> (US only ... scalability VisiBroker Event Services VisiBroker Naming Services IDL integrated stub end ... www.micromail.ie/titles/4927.html [cached](#) | [more results from this site](#)
- Dr.Bob's C++Builder Gate: Borland C++Builder 3 and CORBA** ... is a very good way of making integrated message handling ... I'll restrict myself to Borland Delphi and C++ ... type library from Delphi into a CORBA IDL specification ... www.drbo42.com/cbuilder/corba.htm [cached](#) | [more results from this site](#)

- Borland JBuilder 7 Enterprise Sybase Edition Features Developer ... (PDF)** ... a CORBA server application from an IDL file EJB ... to generate XML packets complying to Borland XML DTD ... Visual SourceSafe © support 2 Integrated team development ... www.sybase.com/content/1020067/JB7_FullMatrixSyb.pdf [view as html](#)
- Amazon.com: Software: Borland JBuilder 5.0 Enterprise** ... create skeleton CORBA server applications from existing IDL files, and ... application servers, including WebLogic, WebSphere, and the integrated Borland AppServer ... www.order-cool-products.com/buy/software/programming/B00005KGTQ.shtml [cached](#)
- ИнфоПлюс :: продажа программного ...** ... основе заданного IDL-описания ... VisiBroker Integrated Transaction Service (ITS ... ключевым компонентом Borland Application ... www.infoplus.kiev.ua/sales/index.php3?bas45 [cached](#)
- Of Interest** ... CA 95066 408-431-1000 <http://www.borland.com> ... Its IDL compiler generates RPC DLLs for Windows 3.1/95/NT ... New features include integrated security, naming, load ba. ... www.ddj.com/documents/s=943/ddj9703/r/ [cached](#)
- Consist: Borland Together** ... for WebSphere Studio is seamlessly integrated into WebSphere ... Borland Together Solo is an economical development solution ... Basic 6, Visual Basic .NET, and IDL. ... www.consist.it/together.htm [cached](#) | [more results from this site](#)
- EJB Server - Visibroker for C++ client FAQ** ... This is according to OMG Java-to-IDL mapping rule which says to map Java ... Inprise IAS is fully integrated with Naming Service and uses it to store references to ... www.borland.com/devsupport/appserver/faq/ejbcppejb_cpp.html [cached](#) | [more results from this site](#)
- Symantec.com** ... for Java, server interfaces are specified with the integrated IDL editor, which ... Integrating with other Java development tools including Borland's JBuilder and ... www.symantec.com/press/1997/n971215.html [cached](#)
- 12750 cb6 long features (PDF)** ... Server object persistence model for greater scalability □ Borland VisiBroker event services □ VisiBroker naming services □ IDL integrated stub end ... www.borland.se/cbuilder/pdf/cb6_feamatrix.pdf [more results from this site](#)
- Emel Software Products** ... these capabilities into a single integrated solution-with ... The unique, Borland Together ControlCenter platform ... Java,™ C++, CORBA,® IDL,™ Microsoft® Visual. ... www.emetisp.co.il/ShowProductDetails.asp?ProductID=5&Title=Together%20Control%20Center [cached](#)
- 12250 JB5 feature matrix 3 (Page 1) (PDF)**

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... a CORBA server application from an IDL file □ EJB ... Java plug-in detection □ □
 Integrated Web Development ... Unified configuration of Borland AppServer for JSP ...
www.borland.ru/jbuilder/pdf/jb5_feamatrix.pdf [view as html](#)

- C++Builder, 4, Borland C++Builder White Paper: Maximizing ...** ... The IDL's stubs and skeletons, header files, and ... set from directly within the integrated development environment ... project manager and instruct Borland C++Builder ... bdn.borland.com/article/1,1410,10117,00.html [cached](#) | [more results from this site](#)
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2. [Borland C++Builder 4 New Features Matrix](#) ... IDL Project integration and CPP Compilation, Two-way IDL Updates, and IDL Syntax Highlighting, x. ... Fully Windows 98/95 support for COM/OLE automation plus NEW! ... [www.tietovayla.fi/BORLAND/CPLUS/bcppbuilder/4/productinfo/newfeatures.html](#) [cached](#)
3. [Delphi 4 SKU Feature Matrix](#) ... Win98/WinNT support for OLE Automation Controllers and ... New: Support for automation object event handling. ... New: Visual Typel library Editor - CORBA IDL Emittter, ... [www.tietovayla.fi/borland/delphi/Delphi4/del4sku.html](#) [cached](#)
4. [Other People's Objects - Article](#) ... And Iona Technologies, the developers of Orbix, have implemented an OLE automation compiler for IDL, opening yet another avenue of access. ... [www.tietovayla.fi/borland/techlib/betz410.html](#) [cached](#)
5. [Borland Conference 97](#) ... property, you are using the TProvider.); Remote DataModule - A specialized data module that exposes OLE Automation calls for a ... olienter.cti, oden40.dll, nbase.idl. ... [www.tietovayla.fi/borland/midas/papers/components.html](#) [cached](#)
6. [BORLAND C++BUILDER 3 COMPETITIVE MATRIX](#) ... ActiveForm Wizards, Yes, No. One step ActiveX / ATL: Integrated IDL / TypelLibrary compiler. Yes, No. ... Yes. Build OLE Automation controllers and servers, Yes, Yes. ... [www.tietovayla.fi/BORLAND/CPLUS/bcppbuilder/3/compmatrix.html](#) [cached](#)
7. [C++ Builder Unleashed, Chapter 27](#) ... tools that automate this process without your having to learn IDL or work ... This way, OLE Automation allows you to control one application from inside a second ... [www.tietovayla.fi/BORLAND/CPLUS/bcppbuilder/4/books/cppbu/chapter27/](#) [cached](#)
8. [Borland C++Builder](#) ... to change things in code, in IDL, or graphically ... performance-monitoring

applications and database automation tools. ... ADO OLE DB and RDS Connexion components, NEW ... [www.tietovayla.fi/cbuilder/5/featuresandbenefits.html](#) [cached](#)

9. [Borland C++Builder](#) ... Automation components for easily controlling MS Office Applications like Word ... IDL Syntax Highlighting, x. x. ... ADO OLE DB and RDS Connection components for complete ... [www.tietovayla.fi/cbuilder/5/featurematrix.html](#) [cached](#)

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[Delphi OLE Automation Servers](#), by Danny Thorpe. Table of contents. ... Let's learn the rest in hands-on steps. [Delphi OLE Automation Server: Design strategy](#) ... [www.tietovayla.fi/forand/tech_ac/autosrv.html](#) [cached](#) | [more results from this site](#)
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4. **SP Grove 1.0 OLE Automation Class** 
How to use the [Grove OLE Automation Class in Visual Basic 5.0](#). Registering DLLs. ... Download the latest [SP Grove OLE Automation Sample with Source Code Now](#). [www.eccnet.com/smgmlp/spwizard/grovoole.html](#) [cached](#) | [more results from this site](#)
5. **OLE Automation for C++ programmers** 
[OLE Automation for C++ programmers](#). Introduction. ... Here are links to the code samples: [OLETest.odt](#); [OLEAut.h](#); [OLEAut.cpp](#); [OLETest.cpp](#). The OLE automation object. ... [www.cgoakley.demon.co.uk/prog/oleaut.html](#) [cached](#)
6. **OLE Automation Routines** 
[OLE Automation Routines](#). Wilbur provides a number of OLE Automation routines which permit indexes to be built and searched by other programs. ... [wilbur.redtree.com/help/oleautomation.htm](#) [cached](#) | [more results from this site](#)
7. **Science Corner** 
... [OLE Automation](#). ... It should have been a simple task--DevStudio, like many other MS apps, exposes its interfaces through [OLE Automation](#). Not so simple! ... [www.reloftoff.com/Win32/auto.html](#) [cached](#) | [more results from this site](#)
8. **Using OLE Automation (Building Applications with Microsoft Access** ... 
[Using OLE Automation](#). ... OLE Automation provides a mechanism for a controller

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18. **OLE Automation** (MICROSOFT WORD) 
... OLE Automation. ... The OLE Automation mechanism is implemented by mg_ocr.dll. Steps to Implement OLE Automation. Follow these steps to implement OLE automation: ...
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19. **OLE Automation** 
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(VBA) to interact with an object (Microsoft Excel). This is a two-way interaction. ...
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9. **Effective OLE Automation** 
Drag-and drop is the most well-known OLE feature and OLE Automation is probably the least well known. ... OLE Automation information. ... www.geocities.com/SiliconValley/Horizon/4519/ole.html [cached](#) | [more results from this site](#)
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- cs423project**
... Information about OLE Automation interfaces is stored in the Windows System Registry and ... definitions from these sources and outputs a CORBA IDL file defining ...
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- Dr.Bob Examines... #31: Delphi & COM (2) - OLE Automation**
... Now then, once you've made sure it's set to IDL (which should be the default ... them in the TEuro42 class, we should compile and register our OLE Automation server ...
[www.drbbob42.com/delphi5/examin31.htm](#) [cached](#)
- 291389 - SAMPLE: Windows CE Local/DCOM Server with OLE Automation**
... Windows CE Local Server Implementation; Windows CE Remote Server Implementation; Marshaling of OLE Automation Types; ... Oasupp, Oaimpl.Idl, 54 KB ...
[support.microsoft.com/support/kb/articles/Q291/3/89.ASP](#) [cached](#) | [more results from this site](#)
- OLE Automation OLE Define OLE Technologies Need For Automation** (PDF)
... lineStyle "J") HRESULT lineStyle([in] int newVal); ; - midl /Oic /h "Calculator.h" /id "guids.c" "autocal.Idl" OLE Automation // Calculator Implementation ...
[www.ncst.emet.in/education/apgdst/compac/lecture/Automation.pdf](#) [view as html](#)
- OLE Automation**
High-Level Automation Server Operation Summary of SSDataConnection Interface Properties ... IDL {propget, id(0x00000001)} HRESULT _stdcall DataChannel(fout, retval ...
[www.vishay.com/company/brands/measurements-group/Software/Interfachi_mds.htm](#) [cached](#) | [more results from this site](#)
- Active Aggressive: TestBC.IDL - Comparison of 1st and 2nd**
... / Generated .IDL file (by ... dll { uuid(80655CE5-273A-11D4-BE92-444553540000), version(1.0) } library TestBC { // TLB : // TLB : OLE Automation : {00020430-0000 ...
[www.vb-faq.com/Articles/Hughson/BCIDL2.htm](#) [cached](#) | [more results from this site](#)
- Other People's Objects - Article**

<http://search.yahoo.com/search?p=OLE+Automation+IDL&ei=UTF-8&fr=fp-top>
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 OLE Controls; Evolution of ... Interface Definition Language; IDL Interface Definition; Defining ...
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- Passing an Interface Pointer from Visual Basic to Visual C++**
... Generated .IDL file (by ... Data Objects 2.5 Library : {00000205-0000-0010-8000-00AA006D2EA4} Importlib("msado15.dll"); // Tlib : OLE Automation : {00020430-0000 ...
[www.msu.edu/~huntharo/portfolio/vb-for-idl/passing-interface-pointer-right-way.html](#) [cached](#) | [more results from this site](#)
- Yahoo! Groups : esker-activex-plugin Messages : Message 372 of ...**
... _DTicTacToeEvents; > ; > Generated .IDL file (by the ... TLib : // TLib : OLE Automation : > {00020430 ...
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 ... model is facilitated by the recent introduction by several ORB vendors of OLE Automation translators which produce automation interfaces directly from IDL. ...
[www.tetovayla.it/BORLAND/techlib/botz411.html](#) [cached](#) | [more results from this site](#)

- OLEEnterprise Technical White Paper**
... to browse shared file systems to locate a pointer to the IDL file for ... The client, an OLE automation controller, creates an OLE automation object method through ...
[www.borland.com/tevsupport/entera/oleolepjd.html](#) [cached](#)
- cvs commit: fptools/hdirect/lib AutoPrim.Idl AutoPrimSrc.c**
... files: hdirect/lib AutoPrim.Idl AutoPrimSrc.c ... clockTimeToDate :: Time.ClockTime -> IO Automation.Date which ... from H98's Time.ClockTime to OLE Automation dates. ...
[www.haskell.org/pipemall/cvs-hdirect/2001-October/000186.html](#) [cached](#)
- Grove OLE Automation Interface**
Starting with version 0.8, Jade includes an OLE Automation interface for groves. ... The IDL file for the interface is included just for documentation. ...
[www.jdark.com/jade/groveoar/](#) [cached](#)
- OpenOffice.org**
... OLE Automation Bridge, Using UNO services in a COM environment and vice versa. Binary TypeLibrary, Binary specification of the UNO typeLibrary. UNO IDL ...
[udk.openoffice.org/](#) [cached](#) | [more results from this site](#)
- Table of Contents for Corba for Real Programmers**
... 85, Names and Scoping. 85, OMG IDL and C++. 87, Standard Exceptions. ... Interface Repository Mapping. 136, OLE Automation and CORBA: Mappings. 139, Architectural Overview. ...
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... structure. Also, you will need to marshal any structures you define in your IDL as OLE Automation won't understand them. Regards ...
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- Dolphin Wiki - CreatingATypeLibrary**
... The OLE Automation library provides marshalling support for all automation compatible interfaces for which a type-library is available. ... IDL ...
[www.object-arts.co.uk/wik/html/Dolphin/CreatingATypeLibrary.htm](#) [cached](#) | [more results from this site](#)
- COM, OLE und ActiveX (PDF)**
... Interfaces Definition in IDL (Microsoft IDL) Minimale Funktionalität ... Features OLE Dokumente - „Compound documents“ OLE Automation - Fernsteuerung von ...
[mbi.dkfz-heidelberg.de/mbi/seminars/oape/SS08/Unterlagen/C++4/c++_win.pdf](#) [view as html](#)
- ATL COM Programming**
... of COM - OLE 2.0; Evolution of COM - OLE Automation; Evolution of COM -

<http://search.yahoo.com/search?p=OLE+Automation+IDL&ei=UTF-8&fr=fp-top>

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- Unified Object Bus Development Guidelines (PDF)** ... The Unified Object Bus: Development Guidelines (September 2000) Gala OS Infrastructure 5.2 ... starts with the definition of the component's interface in IDL. ... [choices.cs.uiuc.edu/gala/doc/dev/UOBDDevGuidelines.pdf](#) [view as html](#) | [more results from this site](#)
- Google Directory - Computers > Programming > Methodologies > ...** ... WithClass - <http://www.microgold.com/Rumbaugh,Booch,Unified,Shlaer/Mellor,Coad-Yourdon.Round-tripengineeringofC++,Java,VB,Delphi,andIDLandcan...> directory.google.com/Top/Computers/Programming/Methodologies/Modeling_Languages/Unified_Modeling_language/Tools/ [cached](#)
- Open Directory - Computers: Programming: Methodologies: Modeling ...** ... WithClass - Rumbaugh, Booch, Unified, Shlaer/Mellor, Coad-Yourdon. Round-trip engineering of C++, Java, VB, Delphi, and IDL and can be extended to generate any ... dmoz.org/Computers/Programming/Methodologies/Modeling_Languages/Unified_Modeling_Language/Tools/ [cached](#)
- Unified Robot Modeling Language (URML)** ... Unified Robot Modeling Language (URML). Motivation. ... DoFtranslation AxisX=Position(-10 10). DoFrotation AxisZ=Velocity. URML to IDL and C++ Mapping. ... www.techinfo.rwth-aachen.de/Forschung/MSR/URML/URML_index.html [cached](#) | [more results from this site](#)
- Alan's Unified Model file utilities** ... Alan's Unified Model file utilities. These are in, roughly speaking, decreasing order of usefulness/sophistication. convancil. ... IDL routines for ancillary files. ... home.badc.rl.ac.uk/wi/um/utlis.html [cached](#)
- IDL - Services** ... The IDL Benefits: - Unified Process approach - Flexible Methodology - Scalable Solutions - Skills in all Development Tools and Languages. © Copyright IDL 2002. www.internet-designers.net/service2.htm [cached](#)
- DBMS - July 1998 - The Unified Modeling Language Takes Shape** ... Some think that the Unified Modeling Language (UML) fills many of these ... Most CASE vendors will produce interface definition language (IDL) stubs from the class ... www.dbmsmag.com/9807d14.html [cached](#)
- Directory - Computers: Programming: Methodologies: Modeling ...** ... WithClass - [cached](#) - Rumbaugh, Booch, Unified, Shlaer/Mellor, Coad-Yourdon.

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 ... DTDs. Transformation Rules. Leveraging Middleware. UML. Unified Modeling Language. IDL. Interface Definition Language. XML. XML Metadata Interchange. MOF. ... wishireconferences.com/metadata/presentations/soley-xmlmeta.ppt [view as html](#)

- L'evoluzione dell'Unified Modeling Language** ... Alcuni pensano che l'Unified Modeling Language (UML) soddisfi a molte di ... di CASE produrrà stub di linguaggio di definizione interfaccia (IDL) dal diagramma ... www.tech.it/twire/mesi/articoli/tw-9901/9901028.htm [cached](#)
- Unified Modeling Language (UML)** ... [ZIP] (collection of IDL files). ... (HTML). Tutorials, FAQs and Docs. Unified Modeling Language FAQ. UML FAQ. OMG-UML Q & A. Object Modeling with OMG UML. ... www.int.fr/~Ralph.Sobek/neptune/uml.shtml [cached](#)
- Alexa Web Search - Subjects > Computers > ... > Modeling ...** ... WithClass Rumbaugh, Booch, Unified, Shlaer/Mellor, Coad-Yourdon. Round-trip engineering of C++, Java, VB, Delphi, and IDL and can be extended to generate any ... www.alexa.com/browse/genera?catid=5659&mode=general [cached](#)

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- A CORBA IDL compiler for SWI-Prolog** ... For output arguments, the converted value is unified with the argument. ... IDL exceptions are mapped onto ISO Prolog catch/throw exception handling. ... www.cs.vu.nl/~elens/documents/corba/pl/picorba.html [cached](#) | [more results from this site](#)
- Unified Modeling Language (UML) Specifications** ... Unified Modeling Language (UML). Specifications. ... ad/01-03-04 (XMI DTD for UML Action Semantics) (DTD). ad/01-03-05 (IDL for UML Action Semantics) ZIP. ... neptune.int.fr/Bib80/uml_specification.shtml [cached](#) | [more results from this site](#)
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- Unified Modeling Language (UML) Tools (rev. 2003-08-09) (PDF)** ... Unified Modeling Language Legende Download dieser Seite Mad About Modeling Solten Sie ein Tool verwenden, vertreiben oder gar selbst ... (3) q COM-IDL q DDLs r ... www.jeckle.de/files/umtools.pdf [view as html](#) | [more results from this site](#)
- <http://www.infi.ulst.ac.uk/~bcs/download/20001114-BCS-UML-talk.ppt>** (MICROSOFT POWERPOINT) ... IDL Overview. Design Patterns. UML Case Tools. Conclusions. copyright AePONA 1999. 7. UML Overview. Unified Modeling Language - a standard for building Object ... www.infi.ulst.ac.uk/~bcs/download/20001114-BCS-UML-talk.ppt [view as html](#)
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- Future Directions for & Distributed Components (MICROSOFT**

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1. [\[mico-devel\] \(no subject\)](#)
... I am interested in doing research on a unified IDL compiler, please give me details of websites, open source compilers which can be modified and other details.
...
www.mico.org/pipermail/mico-devel/2001-December/000523.html [cached](#) | [more results from this site](#)
2. [\[PPDG-Effort-reports\] Andreas Mueller effort CMS CMS-MOP](#)
... Started to work on modifications of DRM that a new unified idl for Hierarchical Resource Managers (HRM) can be used that allows requests of sequences of files.
...
www.ppdg.net/pipermail/effort-reports/2001/msg00016.html [cached](#) | [more results from this site](#)
3. [SCA Training for Developers and Testers \(PDF\)](#)
Page 1. Day 3 - 1 SCA Training for Developers and Testers Day 3: Developing SCA Compliant Waveforms / Applications and Device/DeviceManager ...
jrs.army.mil/pages/sections/technicalinformation/trainingcourse/SCA_Training_-_Day_3_Waveform_Design.pdf [view as html](#)

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cui.unige.ch/meta-index.html [cached](#)
- Bug#194550: ITP: libemail-mime-encodings-perl - A unified ...**
... Next[Data Index][Thread Index] Bug#194550: ITP: libemail-mime-encodings-perl - A unified interface to MIME encoding and decoding. ...
lists.debian.org/debian-devel/2003/debian-devel-200305/msg01761.html [cached](#) | [more results from this site](#)
- Citations: Unified interface development: tools for constructing ...**
Stephanidis, C., Savidis, A., Akoumianakis, D., 1997. Unified interface development: tools for constructing accessible and usable user interfaces. Tutorial No. ...
diseer.nj.nec.com/context/1241080/0 [cached](#) | [more results from this site](#)
- www-ws-arch@w3.org from January 2003: GET vs**
GetLastTradePrice...
GET vs GetLastTradePrice...Is a unified interface bad? From: Edwin Khodabakhchian (edwink@collaxa.com) Date: Thu, Jan 02 2003: Next ...
lists.w3.org/Archives/Public/www-ws-arch/2003Jan/0022.html [cached](#) | [more results from this site](#)
- non-unified interface trips me up again**
... non-unified interface trips me up again. From: Dan Jacobson. Subject: non-unified interface trips me up again. Date: 02 Feb 2002 16:08:15 +0800. ...
mail.gnu.org/archive/html/bug-gnu-emacs/2002-02/msg00028.html [cached](#) | [more results from this site](#)
- DACHS - QNX based Fieldbus solutions, a single unified interface...**
STEINHOFF Logo DACHS Logo www.qnx.com Process Image the single unified interface for all applications and all process IO resources in the QNX based - Product ...
www.steinhoff.de/process-image.htm [cached](#)
- http://bugs.debian.org/194550**
bugs.debian.org/194550
- CONDUIT: control designer's unified interface**
caffeine.arc.nasa.gov/conduit/body.html [cached](#) | [more results from this site](#)
- Peribox::VoiceServer - Unified interface for the rapid creation ...**
NAME. Peribox::VoiceServer - Unified interface for the rapid creation of voice enabled applications. VERSION. This document refers ...
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permit algorithm selection at runtime. The goal ...
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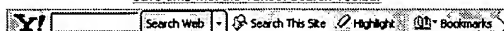
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- [Twisted-commits] Prepare to have a unified interface to handling ...**
[Twisted-commits] Prepare to have a unified interface to handling LaTeX and HTML. moshez CVS twisted-python@twistedmatrix.com Fri, 07 Feb 2003 05:35:18 - 0600: ...
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- Ripple Systems - TransActive Unified User Interface**
... At operator workstations, users are able to log on, and access important information quickly and efficiently through a single unified interface. ...
www.ripple-systems.com/?p=51 [cached](#)
- UM97 Invited Talk by Stephanidis**
... environment. A unified interface comprises a single (ie unified) interface implementation, targeted to potentially all users. The ...
w5.cs.uni-sb.de/~UM97/abstract-stephanidis.html [cached](#)
- Unified User Interface Development**
... Consequently, the PIM tool can be seen as producing interface toolkits which support unified interface development. The G-DISPEC tool ...
www.ercim.org/publication/Ercim_News/enw28/stephanidis.html [cached](#) | [more results from this site](#)
- AT & HCI Lab: UI4ALL: Overview**
... A Unified User Interface (U 2 I) comprises a single (ie unified) interface implementation, encompassing alternative interactive behaviours and sub-dialogues ...
www.jcs.forth.gr/proj/at-hci/html/ui4all_unified_user_interfaces.html [cached](#)
- Configuration 4 GNU (CFG)**
... Config4GNU, a project to provide a single unified interface to system configuration data on Linux computer systems, is still quite active. ...
config4gnu.sourceforge.net/ [cached](#)
- technologies (PDF)**
... aggregating services or functionality across disparate applications or data sources and presenting them to the user in a unified interface, without writing code ...
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- HCI Handbook Table of Contents**
... Implementation architecture; Engineering process. Unified Interface Design: The need: For any given task, diverse user- / context- attribute ...
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... The existing systems do not address the issue of providing a unified interface to

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 ... VoiceGenie Powers Unified Dispatch Voice-Driven Taxi Booking System.
 TORONTO, CANADA — VoiceGenie Technologies Inc., a provider ...
[www.speechtechmag.com/pub/industry/261-1.html cached](#) | [more results from this site](#)
4. **Unified Dispatch**
 News Releases. January 2, 1998. UNIFIED DISPATCH TO RECEIVE FINAL
 APPROVAL. On Monday, January 13, the Bloomington City Council will ...
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7. **1 METHOD OF UNIFIED DISPATCH OPERATION AND RELIABILITY COSTS ... (PDF)**
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 COSTS UNDER DEREGULATED MARKETS. Oscar Moya, Luis Vargas, Rodrigo ...
[146.83.6/bdmc/literatura/Method1ofunilpaper.PDF view as html](#) | [more results from this site](#)
8. **VoiceGenie**
 VoiceGenie Powers Unified Dispatch Voice-Driven Taxi Booking System
 TORONTO, March 12 /CNW/ - VoiceGenie Technologies Inc., the leading provider of
 VoiceXML ...
[www.voicegenie.com/press/pr_031202.html cached](#) | [more results from this site](#)

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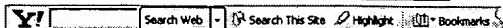
 ... Several counties in Michigan have unified dispatch systems, which remove the
 need for several units of government to operate individual emergency dispatch ...
[www.accesskent.com/pdfs/countydetail/dec2001.pdf view as html](#)

20. **Taxicab, Limousine & Paratransit Association - TLPA - Meetings ...**
 ... Tranware, Inc. Unified Dispatch Unified Software, Inc. VerifEye Technologies.
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9. **Tech-Interns.com**
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 Dispatch Inc. Job Description: UDI has Internships available ...
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10. **Capital Link Russia | Unified Energy Systems of Russia (RAO UES) ...**
 ... UES") of Russia. >After a year of work, a unified dispatch management system
 has been established in Russia. This system ensures ...
[www.capitalinkrussia.com/press/companies/50010042/23859.html cached](#)
11. **Yahoo! Groups : TacoTuesday Messages : Message 5887 of 6493**
 ... website... (www.unified-dispatch.com). ... Bladon? He's now COO of a company
 that I know fairly well, Unified Dispatch (www.unified-dispatch.com). ...
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
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
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
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

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OTHER PEOPLE'S OBJECTS

by Mark Betz

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- [Hey! Where'd You Get Those Plusses?](#)
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Component-based development is one of the hottest concepts in the Windows programming world, and programmers are realizing its advantages. They've discovered how much easier it is to build complex things from smaller, simpler objects than it is to build them whole from one large block of material. In fact, this concept, sometimes called encapsulation, modularity, or information-hiding, has been central to every advance in development practices since toggle switches were a user-input device. It's also been central to object-oriented programming, which adds to it concepts of identity, classification, and object self-awareness. These functions make modules easier to understand, create, and reuse. Well, maybe not reuse: the reuse aspect has yet to meet a lot of people's expectations. And as a proponent of object-oriented approaches, I'm here to offer a mea culpa on behalf of all of us who collected consulting fees while we were going on and on about the reusability of C++ classes. It turns out they're a lot harder to reuse than many of us expected.

It's not that designing reusable interfaces is difficult. The problem is implementing them so that they can be included, in a binary linkage model, in a wide variety of applications. If everyone uses the same C++ compiler and linker, nobody has stepped on anyone else's names, and everyone agrees on which utility class libraries to use, you have a decent chance of producing reusable stuff at a relatively fine level of granularity. DLLs may be a great facility, but even they don't solve the problem: wait until you get a new version of a DLL that changes the size of an exported class or alters the layout of the virtual function table.

Breaking the bond of binary dependence between objects that make up an application is a big issue with components. If encapsulation at the syntax level within a particular language is object-oriented, it's much more object-oriented to encapsulate even these details. You need to link to objects dynamically at runtime and use them, regardless of the language they were implemented in, the operating system they run on, and even the machine that happens to be running them. These last two characteristics elevate components into the realm of distributed-object computing, and this is where the real payoff in the component architecture lies.

Components simplify development by letting you make big things out of little things. It's even simpler when you don't have to build the little things. Just borrow them. In technical terms, rather than building monolithic applications from components that have to be linked every time they are used, construct the applications out of simpler, independently executing objects, each in its own protected address space and designed and implemented by those who best understand what it has to do. You can put these objects anywhere on a LAN or WAN (or the Internet, for that matter) for applications to find and use.

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Such a model provides enormous potential for system integration and business process-level reuse, but before you can reap those benefits organizationally, you'll need to pay careful attention to architectural issues. Let's take a look at a highly reusable architecture for distributed Windows applications. It uses common Windows facilities, such as DLLs and object-oriented ideas of abstraction, to present application developers with simple interfaces to complex behavior. This is an essential design characteristic that allows an organization to structure its development teams for reuse. I chose Orbix, a popular implementation of the CORBA specification from Iona, to support the architecture in the examples.

STICKY-FINGERED SERVERS

Let's begin with a picture of the entire system. Three separate processes are involved, running on two machines connected by a network. Two of the processes are on the server side: the object implementation, which I'll refer to as an object server, and a daemon process that handles server management. There can be many object servers on a host, but there is usually only one daemon. In a system with multiple object-server hosts, each will have a daemon that cooperates with all the others. Together, these daemons make up an information bus that helps connect clients with the objects they need. Its services are independent of the kind of objects being implemented.

The object server provides an implementation of a distributed object. It links libraries or uses DLLs to communicate with the daemon. The daemon manages the object, can start and stop the server process, and provide clients with information about it. The particular implementation of these services, called the ORB core, is specific to Orbix. Other vendors take similar approaches, though some are completely peer-to-peer, a model that raises more design difficulties than technical ones.

The client is similar to the server in that it also links libraries or DLLs to communicate with the ORB core and remote servers. But unlike servers, clients do not normally need a local daemon: the runtime libraries can communicate with any accessible daemon on the net. And whereas the server implements a distributed object on top of the ORB runtime system, the client layers in a set of proxy classes. In the simplest model, these proxies are linked at build time, and then created and called at runtime. The ORB performs the magic that transmits the call and its arguments to the implementation on the remote server, and that treats the results to a similar trip back.

Accomplishing this is no mean feat, as developers of earlier procedural facilities, RPCs, found out. The developer must first provide a way to define types that is independent of any implementation language. This process must be translatable to languages implemented on various operating systems and machine architectures. The runtime system, the ORB, must also be able to transmit data types between these operating systems and architectures. This requires a translation process known as marshaling. Though requirements for marshaling are very complex, marshaling is a system-level service whose functioning can be taken for granted.

CAN YOU DESCRIBE THE OBJECT?

The way objects are described affects the way you use them in applications. CORBA defines an implementation-neutral declarative syntax for describing types. The language is known as Interface Definition Language. IDL is solely about declaring types. It has no implementation concepts such as storage, control of flow, addresses, or any syntax for them. In IDL, you declare objects as interfaces, named collections of methods, and attributes similar to C++ classes in appearance. You also declare any supporting types, such as enumerations, structs, typedefs, exceptions, and the like. Once the IDL is run through a compiler, it emerges as source code translated into an implementation language, often C++.

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The result is a header file that's included on the client and server plus implementation files specific to each.

The translation of an IDL interface into a C++ class is a standard mapping included in the CORBA specification, and most vendors are accepting the standard. In fact, the Orbix compiler produces a hierarchy of classes familiar in shape to any developer who has managed to add common systemic behavior to a number of distinct class hierarchies.

The interface contains a root class called CORBA::Object that is inherited by all the client- and server-side classes. It is how the ORB gets into the act when an object is created or destroyed and when calls are made to or through it. The IDL interface itself is translated into a single class, derived from CORBA::Object, that declares a set of virtual methods that correspond to those in the IDL declaration. Because it is the direct translation of the IDL interface into C++, this class is referred to as an IDL C++ class.

For example, imagine an IDL interface called IBankAccount, which compiles to a C++ class of the same name. The class is used on the client side as a proxy, and it is the only one of the classes generated from the interface that the client knows or cares about. For the server, a class called IBank- AccountBOAImpl is generated. It is derived from IBankAccount and simply redeclares the virtual functions inherited from IBankAccount as pure-virtual. IBankAccountBOAImpl serves as a parent for a derived implementation class called IBankAccountImpl. The redeclaration of the functions as pure-virtual is necessary to force developers to implement all of them. The functions could not be declared pure-virtual in IBankAccount because IBankAccount requires implementations of them for client-side use. They could not be left unimplemented because the server-side needs something to call when an invocation comes in.

The BOA in BOAImpl stands for Basic Object Adapter, a CORBA-standard facility that provides a virtual socket where an implementation can plug into the ORB. In Orbix, it is no more than a derivation point for the implementation class and some simple, though important, constructor behavior. Once the impl class, IBankAccountImpl, is derived from the BOAImpl class, all that's required is an implementation of its virtual functions in a way consistent with the interface's intent. In the example interface, these functions would probably connect to a database to retrieve account data when the client makes a request.

The client-side proxy IBankAccount has implementations of its virtual functions. These implementations call the ORB client runtime system, which packs up the arguments and ships everything off to the server. To use a distributed object, the client has to instantiate a proxy object and then make standard synchronous C++ function calls on it. Naturally, there are some other considerations. The server process has to be registered with the ORB daemon where it is located, and the client has to know the name of that host or a central name server host that can point it in the right direction. In practice, these configuration issues are minimal and can be automated to a large extent by developing distributed system services within the ORB's framework. For the most part, application developers use the distributed objects as if they were local; however, the component developers still haven't achieved true language independence, nor a completely natural usage model for application assemblers. We need to focus more closely on the architecture of the client.

IDL HANDS ARE THE DAEMON'S WORKSHOP

Now all the pieces of a simple distributed-object application are in the picture: The ORB Core finds and manages the object servers; the ORB runtimes connect clients and servers with the ORB Core and each other; the IDL interfaces describe the objects available; and the translations of these interfaces become

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the parents of implementation classes on the server, and are also used as proxies, or call-stubs, on the client. It all works robustly, quickly, and on all of the Windows platforms. So what's the problem?

The problem is, if you give application developers IDL proxy classes to use, you are still presenting them with some subtle dependencies that they could do without. For example, because of wide variation in C++ implementation among various compilers, the generated classes and code are tool-specific. And because of the nonstandard way in which C++ function names are mangled to ensure link-time type-safety, even the compiled, linkable object modules are tool-specific. They're also C++, which is a great language for system-level development, but not necessarily the best platform for all development. To top it off, the IDL translation to C++ is standard, but nobody is completely compliant yet. How can you present the impressive distributed technology embodied in an ORB to application developers in a way that is truly portable and reusable across various languages and development environments?

The answer is to use tried and true techniques of layering. In broad terms, a layer is code that encapsulates other code, uses it, and presents it to the rest of the system in a certain way. Whereas classes increase horizontal modularity, layers increase vertical modularity. Classes break up a particular domain, a user interface, for example, into manageable pieces. Layers isolate interface classes from business classes, and business classes from database classes. Like a database API, ORB technology is middleware, and it makes sense to encapsulate its peculiarities. Also, Windows DLLs are great for storing several layers of code that provide useful interfaces to your distributed objects. They are easy to write, easy for application developers to use and, in Win32 at least, as efficient as statically linked code. You can link the ORB runtimes (or the import libraries for the ORB DLLs), the generated client-side proxy code, and your interface layers to the DLL and hand it over to a developer in one neat package.

In an incremental approach, the first thing to do is make the C++ version available in a self-contained and naturally usable way. The best way is to create a wrapper class for the client-side proxy class. Why a wrapper? Basically, because you don't control the generation of the C++ proxy class from IDL, nor are the compilers compliant with the standard. It's worth the effort simply to isolate applications from changes, but there's another compelling reason: The life cycle of a distributed object is not exactly that of a locally instantiated class. Take a look at the process of object creation, manipulation, and destruction in Orbix:

```
#include

IBankAccount* pAccount;
char* pszServer = "AccountServer";
char* pszHost = "mariner.mars.com";
char* pszName;

pAccount = IBankAccount::_bind
( pszServer, pszHost );
pszName = pAccount->Name();
MessageBox( 0, pszName, "Account", MB_OK );
pAccount->Release();
```

Looks easy enough, doesn't it? After all, it's only eight lines of code. A pointer to the proxy class is created, and then assigned the return value from a static method called _bind that associates it with a server. A call is made on it as through any other class pointer, and then _release is called on it to free the server binding. Anyone using C++ to get at the distributed objects should have no problem following this model. However, this model doesn't account for errors, and there will be errors. The ORB gives a nice, class-based interface to distributed resources, but it can't completely hide all of the stuff in between. Errors that occur in the network layers, for example, have to propagate back to the highest

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layers of the app in some form.

Fortunately, CORBA defines an exception model; Orbix implements it. Though it's not based on C++ exceptions (it will be eventually), a wrapper lets you turn ORB exceptions into C++ exceptions and decide what information goes back up the call stack. Orbix provides macros that approximate the C++ exception syntax. They don't emulate C++ exception behavior very well, but that won't bother the users of your DLL.

My sample code shows an approach you might take in a wrapper layer to bind a proxy to a server with full error-handling. The Orbix macros catch the CORBA errors. Following the CATCH macros, `_release` is called to clean up and a C++ exception is thrown out to the client application. The `IT_X` parameter passed to the `_bind` call and the `Name` method invocation is called a context object, they're the mechanism by which information on server activities, including exceptions, is passed back to the client. Every ORB call takes a context object as a parameter, which defaults to a global context. The Orbix macros simply expand to code that declares one of these named `IT_X` and examines it when the calls return. If it contains an exception, the appropriate catch block is entered.

Although the life-cycle model might not be difficult to understand, it's tedious and cumbersome. But a wrapper class can completely encapsulate the code and let application developers work with C++ classes as usual. In the sample code, you'll find the declaration of a client-side wrapper for `IBankAccount`. The constructor for this class simply executes the `_bind` with full exception handling. The destructor calls `_release`. The wrapper declares member functions that correspond to the methods on the proxy. Each of the functions call the corresponding method on the proxy, again handling exceptions as needed.

The wrapper class can be exported from the DLL and used directly by anyone working in the same compiler that the IDL was translated for. It leaves C++ applications completely independent of changes to the underlying proxy, as long as these do not affect the interface, and also provides a way to translate and abstract lower-level exceptions for client use.

HEY! WHERE'D YOU GET THOSE PLUSES?

C++ developers now have a clean interface to the distributed `BankAccount` object, but what about developers working in other environments? One of the lamentable things about C++ is that at link-time, it's a lot less reusable than C. C++ mangles names and uses a special function-call protocol that passes an object pointer to a member function. But many languages and tools, from Delphi to Visual Basic and Powerbuilder, can call C functions in a DLL, so a good step is to export a C interface to your wrapper class. The only problem is that this model is a lot harder to design and implement than the wrapper class. A typical method used throughout the Windows API is to replace objects with handles and member functions with C functions that take handles. Two management chores that crop up are keeping track of handles on a list and associating the last received exception with the handle to the object that caused it. When compiled for C, handles aren't typesafe, so you'd need to check each entry to each function to ensure that the handle was valid. The C API can be placed in the same DLL that exports the wrapper class. Depending on the needs of the app, it can also be placed in its own DLL.

Using either the C++ or C access strategy, this model has a lot of potential. Imagine a client application in Boston and an account object server hanging off an Internet node in Chicago. What would an application developer normally have to do to obtain and print out the name of a particular account owner in such a case?

```
try {
    pBankAccount = new BankAccount
```

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```
( "0112143" );
MessageBox( 0, pBankAccount->Name(),
    "Name", MB_OK );
delete pBankAccount;
}
catch( ... ) {
    MessageBox( 0, "error", "Name", MB_OK );
}
```

I don't mean to minimize issues of naming, version control, database fault-tolerance, or any of a host of other technical issues that pop up in distributed systems. But the ORB reduces the level of detail at which the application has to deal with these issues and also provides an excellent framework for innovative ways to deal with them. In my experience, all of these solutions have involved high-level programming at the ORB interface. Programmers have not had to deal with networks at the level of the distributed object interface, much less in the application.

MONEY FOR NOTHING, OBJECTS FOR FREE

But what about performance? First, there's the ORB issue. Orbix has proven to be as efficient at transporting data across the network as the protocols and physical media allow. The protocol for Orbix, and most other ORBs, is TCP/IP by default. Second, the designer of an interface can greatly affect performance by deciding how the state of the remote object is retrieved into the client address space. The examples I chose illustrate a call-level interface, but it would be as easy to define a structure and stream the structure back in one chunk.

On the client, the wrapper class can access the structure when member functions are called. One performance test involved setting up an account object client with a C++ wrapper on a Pentium 90 running NT. The client was connected over a 28.8 kilobit PPP serial line to the server running on another P90. The server in turn accessed Microsoft SQL Server running on a high-performance Compaq with two P60 processors. The test made 10 calls to the remote object, each of which returned a string varying in length from 10 to 50 characters. Assuming the server was already running, it required approximately 1,100 milliseconds to bind, retrieve the data, and release the proxy. If the ORB had to start the server, that time could extend to 4,000 milliseconds. Fortunately, servers are usually persistent. Given our slow link and call-level access model, the performance is clearly acceptable, and it's pretty cool to imagine all this happening over the TCP/IP Internet.

Where can you go from here? The DLL-based client architecture I've discussed here forms a nice foundation for interfacing an application to distributed objects at even higher levels of abstraction. The DLL could form the core of an OLE object, such as an OCX, a Delphi VCL component, or a VBX. Application developers could paste your distributed account object into their spreadsheets. And Iona Technologies, the developers of Orbix, have implemented an OLE automation compiler for IDL, opening yet another avenue of access. In addition, distributed object computing has another advantage just as important as its implementation benefits: It enables an organization to structure its software teams into mutually dependent groups of component developers and assemblers.

With all the capabilities of this model, there's no reason not to go ahead and use other people's objects. After all, everybody's doing it. Mark Betz is director of object technologies at Block Financial Corp.'s Technology Center in Upper Montclair, New Jersey, where he works on distributed multimedia information systems using C++ and Orbix.

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Distributed Objects and Delphi

by Mark Betz

One of the payoffs of careful architecture is that you are free to choose tools which are appropriate for each layer of the system. At the data access layer you might roll your own calls to some database API library, or layer in a portable data access API from a third-party vendor. Whichever route you choose, if the architecture is well-partitioned your choices shouldn't affect other parts of the system. This freedom to choose is perhaps most valuable at the user interface. Why? Because the user interface often involves complicated code that is subject to frequent changes as the system evolves. A great deal of time is invested realigning an interface to meet visual and ergonomic goals, or to comply with semantic changes. So it is no wonder that Delphi has achieved great popularity. When the UI is built with Delphi aesthetic changes often require no coding at all, and semantic changes can be rendered visually by nearly anyone, and then handed off to development so that the skeletons can be implemented. When the UI is built as a thin layer on top of distributed business and application components this model becomes a powerful catalyst for rapid development.

So, how best to get there? This article has described an architecture for distributed objects on the Windows family of operating systems. The result of patterning a system on this kind of architecture is that it exposes the application model as a clean, distributed API which is expressed in an implementation-neutral syntax that can be mapped into either C, C++, or Smalltalk. Starting with that API as a basic interface to the application we can build several different architectures which culminate in a UI produced with Delphi. We'll look briefly at three models: a native VCL-to-ORB connection, an OLE-to-ORB route, and an OLE Automation interface.

The VCL-to-ORB model begins with the basic architecture as described: a layer of IDL C++ proxy's which represent the IDL interfaces to the distributed app, and on top of that a C API layer which translates object pointers into handles. To increase reusability a C++ wrapper layer can be inserted between the C API and the IDL C++ proxy's. The IDL C++ proxies and the C++ wrapper can be in one DLL, which exports the wrapper classes, and the C API can be in another. The resulting architecture is shown below. This provides maximum flexibility, since code which can use the C++ wrappers directly isn't encumbered with the C API. In Win32 these DLLs can be extremely simple to design and implement.

As shown in the figure Delphi's VCL components are layered on top of the C API, which they can call using cdecl as a procedure declaration modifier in the Object Pascal code, and extern "C" in the DLL. The interface is admittedly a bit clumsy: when a VCL is initialized it must acquire a handle to a distributed interface through the C API, and must then specify this handle in calls to that API which manipulate the interface. [NOTE, TOM: CAN DELPHI CALL BORLAND C++ CLASSES DIRECTLY?] The handle in this sense replaces the hidden this pointer in C++ which addresses the object being operated on.

The benefit of the previous model is that it can be used directly from Delphi, which is distinguishable as one of the few tools of its kind which can be used to extend itself. A variation on this architecture replaces the VCL component with an OLE object or OCX control, which can be dropped into a Delphi form. The interface between the OLE object and the ORB would be made through the C API if the OCX was written in Delphi [NOTE, TOM: CAN DELPHI CREATE OCXS?], or it could be linked directly to

the exported C++ wrapper classes if it is written in C++. Architecturally there is little difference between these choices: both result in a drop-in control which contains the interface to a distributed object. The potential advantage of the OCX approach is that the resulting control could be used in broader contexts: including Delphi, MFC, Visual Basic, Powerbuilder, and Gupta apps. And let's not forget Visual Fortran. In either case you will achieve the key goal: separation of the system's complexity from the task of creating a user interface to it.

The third and last model uses an OLE Automation bridge to the distributed system. In this model an OLE Automation server is created which interfaces to the distributed system. The architecture of this server would be similar to those described above, except that the top layer is an OLE Automation interface instead of a UI, as shown below.

The Automation server can be written in any language capable of implementing OLE interfaces, and it can be accessed by any language capable of calling a procedure pointer and passing a string. If the server is written in C++ then the intervening and cumbersome C API can be left out, and the automation interfaces can use the exported C++ wrapper classes directly. This model is facilitated by the recent introduction by several ORB vendors of OLE Automation translators which produce automation interfaces directly from IDL.

Any one of these models, in combination with the distributed component architecture described in the article, provides a degree of flexibility and reusability which is difficult to achieve with any other approach. Extremely complex server-side functionality can be reduced to controls which are dragged off of a palette and dropped onto a form. There are certainly issues, such as exception handling, which have not been dealt with here, but they are easily solved within the framework presented. Ultimately these system architectures support the original goal of tools like Delphi, Visual Basic, Powerbuilder and others: to allow developers to focus on solving the business problem by making user-interface questions the last of their worries.

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